February 17, 2005

Francine Torres
National Organic Program
USDA-AMS-TMP-NOP
1400 Independence Ave., SW
Room 4008-So, Ag Stop 0268
Washington, DC 20250-0200

Dear Ms. Torres:

I was asked to write a letter addressing the petition for use of ferric phosphate as a pesticide to prevent damage and destruction of various crops in organic production. My understanding is that the date of the NOSB meeting at which the petitioned substance will be evaluated will be February 28 to March 3, 2005. Being that I am in full agreement with this petition, I agreed to write a letter of support.

By way of introduction, I am Dr. Ronald B. Hammond, Professor of Entomology, Ohio Agricultural Research & Development Center, The Ohio State University, Wooster, OH. I have been employed here for the past 26 years as a field crop entomologist. My areas of interest have been in conservation tillage, host plant resistance, and integrated pest management (IPM). Recently, I have become involved with the OFFER program, Organic Food and Farming Education and Research, at the OARDC under the direction of Dr. Deb Stinner. This work has lead to numerous research projects on organic field crop pest problems, including a recently funded project on potato leafhopper management in organic alfalfa using potato leafhopper resistant alfalfa. Over the past few years, I have met with organic producers and have become familiar with the various pest problems that organic growers deal with on a yearly basis.

My primary interest concerning this petition comes from my work in conservation tillage. Because of the crop residues left on the soil surface, slugs have become one of the most serious, if not the greatest impediment, to no-till farmers. Slugs have become a major issue in much of the eastern U.S., on field crops including corn, soybean, oil-seed rape, cotton, sunflower, and alfalfa. Approximately 10-12 years ago, I began a research program on slugs in such systems, which has now expanded to dealing with slug problems in vegetable crops, greenhouses, and horticultural settings. This work has led to numerous publications on slugs, including many on the efficacy of available slug baits (see enclosed publications). Because of the lack of researchers doing work with slugs in the U.S., I have become one of the few experts on slugs in this country. I have given numerous presentations on slug issues on all crops throughout the Midwest, visited with growers and gave a presentation at a major no-till conference in Argentina, and attended the two most recent International Snail and Slug Conferences in Canterbury, England, the most recent being in 2003. I have also written the chapter "Agriolimacidae and Arionidae as Pests in Conservation Tillage Soybean and Maize Cropping in North America" in the most recent book on slugs, "Molluscs as Crop Pests", edited by G. M. Barker from New Zealand, published in 2002. I point out these items only to indicate my extensive background in this area.

Slugs can be an extremely severe problem in most cropping situations, as slugs will consume most any plant. Slugs are a problem on germinating seeds and young seedlings, as well as on various vegetables grown for produce. For field crops or vegetables, a large slug population can cause 100% loss, totally destroying all plants. The only remedy is replanting, which usually will still require some sort of control measures as the slugs are still present. Unlike many insect pests where larvae become adults and end their feeding (i.e., caterpillars molting to moths or butterflies, maggots becoming flies), slugs continue to grow, and thus feed at even greater amounts. In numerous vegetable and horticultural crops, the mere feeding injury on produce or the plant makes them completely undesirable, often causing a total loss to the grower. In a number of situations, the "loss" to the crop is because of the actual presence or evidence (i.e., slime) of slugs that make the produce or plant undesirable. Many consumers have a much greater repulsion to the presence of slugs than to insects.

Slugs are very difficult to manage, and there are very few control tactics that are 1) effective, 2) consistent, and 3) safe. For conventional growers, there are a few molluscicide baits available. In the U.S., the only two are metaldehyde baits (of which there are numerous brands available) and those containing ferric phosphate (e.g., Sluggo). In Europe, there are two others, methiocarb (Mesurol) and thiodicarb (Larvin), both which are also insecticides and much more toxic than metaldehyde. All the current effective, economical, and consistent control tactics are baits. Nothing else offers the consistent, economical control required by growers.

For organic growers, the choices are limited, if not almost non-existent. None of the current baits are approved for use. Currently, the only management tactics available are various 'home remedies' usually associated with trial-and-error approaches. Most of these were addressed in the petition. These include, but are not limited to:

Picking slugs from plants and drowning them
Placing beer in cups to attract than then drowning them
Placing eggs shells, dog hair, coffee grounds, diatomaceous earth etc., around on the soil
Use of repellants
Mixing ammonia and water and spraying on slugs

There are as many home remedies as one can think of. However, all have the same problems: they are only appropriate for very small areas; many have to be reapplied on a continuous basis because rain or other environmental factors dilute them; and none work that effectively or consistently. None are really appropriate for crop production, whether we are discussing field crops, vegetable, or horticultural plants. From attending numerous meetings here and abroad, none of these methods are appropriate for grower-oriented production systems, conventional or organic.

Another tactic often mentioned is the use of barriers, most usually copper bands or strips. While this method does work, it is for protecting a single or a few plants. And then, it has to be placed around a plant(s) where you are sure there are no slugs already present. Otherwise, you have just caged the slugs on that plant. As with the other remedies, it is not appropriate for larger areas. And I would stress than when I use the term "larger" areas, I am referring to anything larger than a home garden and would include most all organic farms.

Organic growers need a management tactic that will provide them with an effective, economical, and consistent way to control slugs and snails. Ferric phosphate offers this potential. My studies have shown that these baits offer an acceptable level of control. The first table is from a study in 2002 where Sluggo was tested in corn. This second table is from 2003, which included a product called PCC1030, which is a similar ferric-containing bait. Both worked very well.

Treatment/ formulation	Rate amt form/acre	No. GGS/corn plant 6 DAT	18 DAT
Untreated check	--	3.6a	7.6a
Deadline MPs 4%	5.0 lb	0.5b	0.9bc
Deadline MPs 4%	7.5 lb	0.9b	0.6cd
Deadline MPs 4%	10.0 lb	0.0b	0.3d
Sluggo 1%	10.0 lb	0.2b	1.5b

Means followed by the same letter are not significantly different (LSD, P = 0.05).

Treatment/ formulation	Rate amt formulation/ acre	6 DAT No. slugs/ corn plant	6 DAT Injury rating	13 DAT No. slugs/ corn plant	13 DAT Injury rating	23 DAT Injury rating
Untreated check	--	1.8a	3.8a	3.1a	4.6a	4.3a
PCC-1030	10.0 lb	0.9b	1.9b	0.8bc	2.0bc	2.1bc
PCC-1030	20.0 lb	0.3cd	1.3bc	0.3d	1.4cd	1.6c
PCC-1030	40.0 lb	0.1d	1.0c	0.2d	0.6d	1.4c
Trail's End LG 3.5%	10.0 lb	0.6bc	1.8b	1.1b	2.3b	2.6b
Deadline MPs 4%	10.0 lb	0.3cd	1.3bc	0.5cd	1.5bc	1.9bc

Means followed by the same letter are not significantly different (LSD, P = 0.05).

Although for conventional growers, I recommend the metaldehyde-containing materials, I always mention iron phosphate baits, such as Sluggo, as an alternative for those wishing a different type of material. In the future, there might be other tactics that are consistent and efficacious for larger scale situations that fit into the organic system. Various natural materials appropriate for baits are being researched including caffeine and quackgrass extracts, and a nematode that kill slugs and snails. However, the information I have seen suggests none of those potential baits are near to marketing, and both will have major problems. Caffeine, while natural, is very toxic to many invertebrates. The latter tactic, nematodes, offers much promise, and is perhaps the only non-bait tactic being researched. However, the nematode in question does not occur naturally in the U.S., and will probably never be introduced into the country. While showing decent efficacy in England, nematodes are very temperamental to work with (being that it is another organism) and very expensive to use! Although not mentioned above, I have collaborated with a Dr. Parwinder Grewal who is located at the OARDC, on this nematode. We have a lot of experience with this it, including having searched the eastern U.S. for it. As expected, all the work has been in the laboratory because of it not being in the U.S. naturally.

I note in reading the summary of the TAP reviewers' analyses, that two of the reviewers did not recommend allowing ferric phosphate as a molluscicide for organic crop production because both felt there were other organic alternatives. I would agree with this viewpoint if we were talking about home gardeners who wanted to GARDEN using natural methods. They would be dealing with single plants or a few plants in a relatively small area, most likely growing for their own use. However, these methods are really not alternatives for people who are FARMING organically.

The main reviewer I would like to comment on is reviewer 3. The reviewer states that numerous practices exist and have been relied on for many years. I would agree with that reviewer that organic farmers have relied on these alternatives, but that is because of a lack of anything else that could be used. Having been relied on does NOT equate with having worked well. There appears to be a strong bias to keep everything non-synthetic, which I do not feel is helpful for organic growers in this situation. It would seem that to be sustainable, one has to include being able to manage problems on a consistent basis.

In summary, ferric phosphate, while being synthetic, is a totally safe and appropriate material when used correctly. While "alternatives" exist in organic crop production on paper, none offer an effective, consistent, and economical level of control. The only potential for harm from this material appears to be due to a spillage, which I would assume is probably a concern for most any material, including many of the natural ones. Although I hopefully explained my reasons why I am in support of this petition, I would be more than willing to further discuss it with you via telephone at 330-263-3727. Thank you for taking the time to read this letter.

Sincerely,

Ronald B. Hammond, Ph.D.
Professor of Entomology